Homework: 2.2 / 31-40

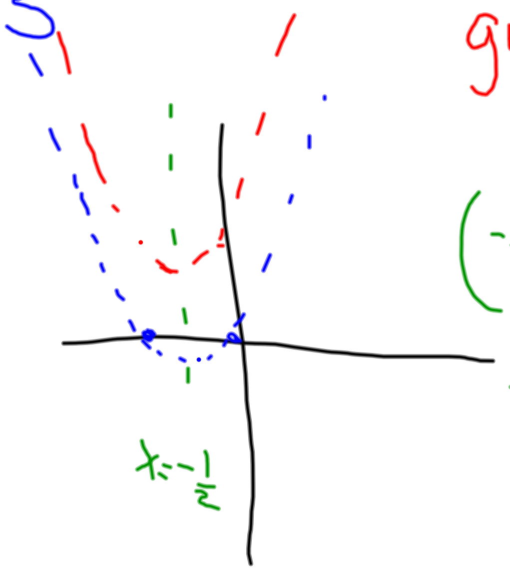
36 bacdefg
32
35ab
37
39 - 40

35) $f(x)=\frac{x^3-1}{x-1}$ substituting $\Rightarrow \frac{0}{0}$ [IDK]

a) $\lim_{x\to 1}\frac{x^3-1}{x-1}=\lim_{x\to 1}\frac{\cancel{(x-1)}(x^2+x+1)}{\cancel{x-1}}$

$=\lim_{x\to 1}(x^2+x+1)=3$

b) sketch graph:



graph (x^2+x+1)

graph (x^2+x)

$x(x+1)$

$\left(-\frac{1}{2}\right)^2+\left(-\frac{1}{2}\right)+1$

$\frac{1}{4}-\frac{1}{2}+1=\frac{1}{4}-\frac{2}{4}+\frac{4}{4}$

36) $f(x) = \begin{cases} \dfrac{x^2-9}{x+3}, & x \neq -3 \\ \cancel{k}\ -6, & x = -3 \end{cases} = (x-3)$

a) find $k \ni k = f(-3) = \lim_{x \to -3} f(x) = -6$

$$\lim_{x \to -3} f(x) = \lim_{x \to -3} \frac{x^2-9}{x+3} = \lim_{x \to -3} \frac{(x-3)\cancel{(x+3)}}{\cancel{x+3}}$$

$\frac{0}{0}$

$$= \lim_{x \to -3} (x-3) = -6$$

$$\boxed{k = -6}$$

37) (★) $\lim_{x\to 0^+}\left(\frac{1}{x}-\frac{1}{x^2}\right)=\lim_{x\to 0^+}\frac{1}{x}-\lim_{x\to 0^+}\frac{1}{x^2}=+\infty-(+\infty)=0$

a) why is this "incorrect"

b) show ★ $= -\infty$

$$\lim_{x\to 0^+}\frac{\overset{-}{x-1}}{\underset{+}{x^2}}$$

$\to$ DNE

$\to +\infty$

$\to -\infty$

$-$

39) $\lim_{x\to 0} \frac{\sqrt{x+4}-2}{x}$ (yarda yarda IDK)

$= \lim_{x\to 0} \frac{\left(\sqrt{x+4}-2\right)}{x}\left(\frac{\sqrt{x+4}+2}{\sqrt{x+4}+2}\right)$

$= \lim_{x\to 0} \frac{(x+4)-4}{x\left(\sqrt{x+4}+2\right)} = \lim_{x\to 0} \frac{\cancel{x}}{\cancel{x}\left(\sqrt{x+4}+2\right)}$

$= \lim_{x\to 0} \frac{1}{\sqrt{x+4}+2} = \frac{1}{2+2} = \frac{1}{4}$

40) $\lim_{x\to 0} \frac{\sqrt{x^2+4}-2}{x}$

$= \lim_{x\to 0} \left(\frac{\sqrt{x^2+4}-2}{x}\right)\left(\frac{\sqrt{x^2+4}+2}{\sqrt{x^2+4}+2}\right)$

$= \lim_{x\to 0} \frac{(x^2+4)-4}{x\left(\sqrt{x^2+4}+2\right)}$

$= \lim_{x\to 0} \frac{x^2}{x\left(\sqrt{x^2+4}+2\right)}$

$= \lim_{x\to 0} \frac{x}{\sqrt{x^2+4}+2} = \frac{0}{4}$

$= 0$

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36
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37
40

36) $f(x) = \begin{cases} \dfrac{x^2-9}{x+3}, & x \neq -3 \\ \cancel{k}\ -6, & x = -3 \end{cases}$ $= \underline{x-3}$

a) find $k \ni$ $k \to f(-3) = \boxed{\lim_{x \to -3} f(x)} = -6$

Polly NoMial:

$C_n x^n + C_{n-1} x^{n-1} + \cdots + C_1 x + C_0$

$\lim_{x \to -3} \dfrac{x^2-9}{x+3} \to \dfrac{0}{0}$ IDK

$= \lim_{x \to -3} \dfrac{(x-3)\cancel{(x+3)}}{\cancel{(x+3)}} = \lim_{x \to -3}(x-3) = -6$

$\boxed{k = -6}$

37) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{x^2} \right) = \lim_{x \to 0^+} \frac{1}{x} - \lim_{x \to 0^+} \frac{1}{x^2} = (+\infty) - (+\infty) = 0$

Remember

$\lim_{x \to 0} \frac{1}{x}$

a) why am I stoopid?

b) $\lim_{x \to 0^+} \frac{\overset{-}{x-1}}{\underset{+}{x^2}}$ $\frac{\to -1}{\to 0}$

DNE

$+\infty$

$-\infty$

39)

$$\lim_{x\to 0} \frac{\sqrt{x+4}-2}{x} \quad \frac{\to 0}{\to 0} \text{ IDK}$$

$$= \lim_{x\to 0} \left(\frac{\sqrt{x+4}-2}{x}\right)\left(\frac{\sqrt{x+4}+2}{\sqrt{x+4}+2}\right)$$

$$= \lim_{x\to 0} \frac{(x+4)-4}{x\left(\sqrt{x+4}+2\right)} = \lim_{x\to 0} \frac{\cancel{x}^{1}}{\cancel{x}_{1}\left(\sqrt{x+4}+2\right)}$$

$$= \lim_{x\to 0} \frac{1}{\left(\sqrt{x+4}+2\right)} = \frac{1}{2+2} = \frac{1}{4}$$

40)

$$\lim_{x\to 0} \frac{\sqrt{x^2+4}-2}{x}$$

$$= \lim_{x\to 0} \left(\frac{\sqrt{x^2+4}-2}{x}\right)\left(\frac{\sqrt{x^2+4}+2}{\sqrt{x^2+4}+2}\right)$$

$$= \lim_{x\to 0} \frac{(x^2+4)-4}{x\left(\sqrt{x^2+4}+2\right)}$$

$$= \lim_{x\to 0} \frac{x^2}{x\left(\sqrt{x^2+4}+2\right)}$$

$$= \lim_{x\to 0} \frac{x}{\sqrt{x^2+4}+2}$$

$$= \frac{0}{4} = 0$$

35) $f(x) = \dfrac{x^3-1}{x-1}$

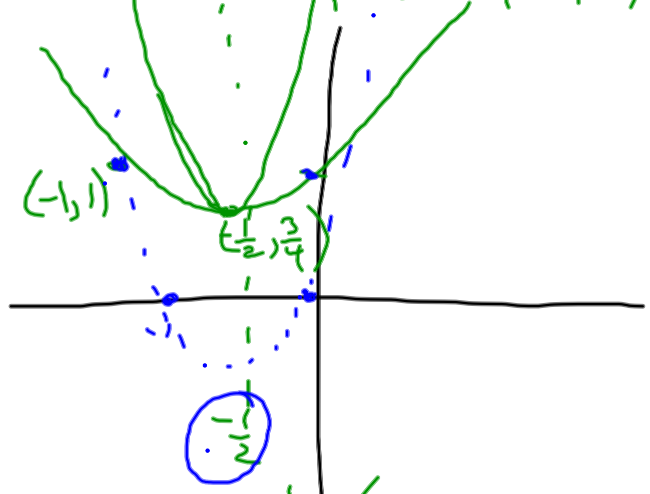
$$\lim_{x\to 1} \frac{x^3-1}{x-1} = \lim_{x\to 1} \frac{(x-1)(x^2+x+1)}{(x-1)}$$

$$= \lim_{x\to 1} x^2+x+1 = 1+1+1 = 3$$

b) graph $\dfrac{x^3-1}{x-1}$ — x^2+x+1, $x \neq 1$

graph x^2+x+1

$\frac{1}{4} - \frac{1}{2} + 1 = \frac{5}{4} - \frac{2}{4} = \frac{3}{4}$



graph(x^2+x)

graph$(x(x+1))$